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ABSTRACT

This final report on the Mathematics Teacher Resource Development project of the District of Columbia schools identifies the background and project objectives, with a description of the project; outlines the external evaluation design; and describes the results. The target population consisted of teachers needing courses to meet mathematics certification requirements, mathematics teachers needing to upgrade their skills, and potential mathematics teachers for recruiting to District schools. The plan included courses offered through cooperation with local universities as well as the District Mathematics Department, with teachers demonstrating skills acquired. A symposium and other methods assisted in the recruitment of teachers. Staff development and credit courses were taken by 167 teachers, with the enrollment in 11 certification courses totaling 92. So far, 61 teachers have earned credit toward certification as mathematics teachers. Appendices present the evaluation model scheme, training support survey forms, needs assessment forms and results, samples of mathematics course offerings, the symposium agenda and committees, recruitment and placement plan, training plan, comprehensive plan for mathematics education, self-evaluation survey forms, and courses in the certification program. (MNS)



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# MATHEMATICS TEACHER RESOURCE DEVELOPMENT

## FINAL EVALUATION REPORT

DECEMBER 1983

FLORETTA D. McKENZIE
SUPERINTENDENT OF SCHOOLS

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PUBLIC SCHOOLS OF THE DISTRICT OF COLUMBIA

# MATHEMATICS TEACHER RESOURCE DEVELOPMENT

Final Report

1982-1983

Prepared by
Division of Quality Assurance

1982-1983

MATHEMATICS TEACHER RESOURCE DEVELOPMENT

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Dorothy C. Stephens, Project Manager

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## SUMMARY AND FINDINGS

### Title

Mathematics Teacher Resource Development

### Project Coordinator

Bessie Howard

### Location

The project office is located in the Instructional Services Center at Langdon School. Courses are offered in various schools and centers throughout the District.

### Target Population

The target population consisted of DCPS teachers needing courses to meet mathematics certification requirements, mathematics teachers needing to upgrade their skills, and potential mathematics teachers for recruiting to the District of Columbia Public Schools (DCPS).

### Background

The Mathematics Teacher Resource Development project was deemed necessary to meet the rising tide of a decline in student mathematics scores, untrained teachers in the field of mathematics and fewer teachers entering it. These facts were found in studies throughout the United States as well as in the DCPS, and summarized at the National Convocation on Precollege Education in Mathematics and Science, held on May 12th and 13th, 1982. This led to the application for ECIA Chapter 2 funding to plan a program that would help alleviate the problem in the DCPS.

### Description of the Project

A plan was developed to upgrade mathematics teachers' skills with courses through cooperation with local universities as well as the DCPS Mathematics Department. Teachers taking the courses would be able to demonstrate the skills they acquired. Another part of the plan was to have a symposium and other methods to assist in recruiting mathematics teachers to the DCPS.

### Stated Objectives

A. By June 1983, a Mathematics Teachers' Training Program and a Mathematics Teachers' Recruitment program will be established in the District of Columbia Public Schools as evidenced by a report to be submitted to the Superintendent of Schools.

B. At least 90% of the teachers who attend the mathematics inservice training will demonstrate knowledge of the course content in the manner designated by the course instructor.

## Evaluation

The evaluation follows the Planning, Monitoring, and Implementing (PMI) Evaluation Model for Decision-Making which was developed by the Division of Quality Assurance, District of Columbia Public Schools.

## Findings

1. A symposium, attended by local universities, businesses, professional organizations and DCPS staff, was held to present ways to support and encourage the training and recruitment of mathematics teachers.

2. Needs assessments were completed and a sequence of training established which matched the identified needs.

3. Members of the DCPS Mathematics Department worked with representatives of the DCPS Division of Personnel to develop plans for recruitment and placement of mathematics teachers.

4. Time restraints prevented the designing of a pilot study to measure the impact on students of the teacher training program.

5. A three year plan for the establishment of a Mathematics Teachers Training Program for certification in cooperation with UDC was completed.

6. Proposals for additional funding to support further training for both elementary and secondary teachers of mathematics were written and submitted to appropriate agencies.

7. Activities to encourage recruitment into the teaching of mathematics were documented and included work with Advisory Group Members from colleges and universities and the ordering of posters on mathematics teaching as a career, for all DCPS high schools.

8. Mathematics Course selection counseling was provided to teachers.

9. Staff development and credit courses were taken by 167 teachers with the enrollment in 11 UDC certification courses totaling 92.

10. So far, 61 teachers have earned credit toward certification as a mathematics teacher, through the UDC/DCPS program.

## BACKGROUND AND PROJECT DESCRIPTION

### Introduction

Purpose - The goal of the MATHEMATICS TEACHER RESOURCE DEVELOPMENT program was to increase the capability of teachers to provide effective mathematics instruction to students, pre-K through 12th grade.

Need - The need was based on standardized test data and course grades showing low academic achievement of DCPS students in mathematics. Nationally, as well, students demonstrated lower interest and achievement in mathematics. Related to this information was the fact that the number of qualified teachers was steadily diminishing. According to Education Week, March 31, 1982, there has been a 77% decline in the number of secondary level mathematics teachers prepared in 600 teacher-training programs in the United States. Among newly employed mathematics and science teachers, over half of them were judged by their principals to be unqualified to teach in those fields but had been hired on an emergency basis because qualified teachers could not be found. The DCPS reflected this national trend. Out of necessity mathematics classes were assigned to teachers whose training had prepared them for other subjects. Many of them had few if any mathematics courses in college.

History - The National Convocation on Precollege Education in Mathematics and Science was held on May 12th and 13th, 1982. The summary from that conference included the following:

On Teachers - "There is a shortage of mathematics and science teachers. Many of those teaching now are ill prepared; others are leaving the profession."

On Instruction - "Quite aside from the supply of adequately prepared teachers, there are problems with the substance and process of instruction."

On students - "Students are getting less science and mathematics and on the average, are doing poorly. Improving teacher preparation and bringing instruction up-to-date are necessary but not sufficient; student motivation and exposure must also be increased."

The national problem documented at the convocation had been felt in the District of Columbia Public Schools. Plans to determine and implement ways of alleviating the problem were submitted to the Superintendent who approved the inclusion of the project in the ECIA Chapter 2 program. The 1982-83 year was the first year of the project under Chapter 2 funding.

### Description of the Project

Target Population - The target population consisted of teachers in the DCPS who needed further training for certification as mathematics teachers, mathematics teachers in the DCPS who needed to upgrade their skills in order

to provide quality instruction to students, and potential mathematics teachers who might be recruited to teach in the DCPS.

Staffing - Coordination of the project was done under the Assistant Director for Resource Development. Also funded by the project was a Mathematics Resource Teacher Trainer. A clerk was shared with the Basic Skills Centers project. Other staff contributing to the project but not funded under Chapter 2 were the Director of the DCPS Instructional Services Center, the Supervising Director of Mathematics, a representative of the DCPS Division of Personnel, Course Instructors and members of the Advisory Committee including representatives of area universities, business, professional organizations and the DCPS.

Project Components - The project was set up to design and begin implementation of a mathematics teacher training program and to plan and establish a mathematics teacher recruitment program. Much of the first year of the project was devoted to planning and to making arrangements to carry out the plans. A symposium was to be held as part of the teacher recruitment component. Cooperation with local universities for courses was sought as well as using talent from the DCPS Mathematics Department. Teachers taking courses would be evaluated on their knowledge of course content.

## EXTERNAL EVALUATION DESIGN - PLANNING, MONITORING AND IMPLEMENTING (PMI) EVALUATION MODEL FOR DECISION-MAKING

The evaluation follows the Planning, Monitoring, and Implementing (PMI) Evaluation Model for Decision-Making which was developed by the Division of Quality Assurance, District of Columbia Public Schools. (See Appendix A.) The evaluation design which was developed at the beginning of the project year, consisted of the intended inputs, processes and outcomes on specially designed status report forms. The interim report distributed at the mid-point of the project cycle related, on the status report forms, agreements or discrepancies between intended and observed inputs and processes. This final report includes the interim report data brought up to date, plus the agreements and discrepancies between intended and observed outcomes for each objective. Supporting data are included in the appendix. Preceding the PMI status report forms is the results section which summarizes the agreements and discrepancies for each objective and states a general conclusion.

# RESULTS

The results of the evaluation are summarized in this section. Following the narrative summaries are the inputs, processes and outcomes on which these summaries are based. Supporting data are in the appendix.

Objective A - By June 1983, a Mathematics Teachers' Training Program and a Mathematics Teachers' Recruitment Program will be established in the District of Columbia Public Schools as evidenced by a report to be submitted to the Superintendent of Schools.

Objective A was on the establishment of a Mathematics Teachers' Training and Recruitment Program. There was agreement between all observed and intended inputs. Staff input in addition to mathematics specialists, included representatives of universities, businesses and professional organizations for an advisory committee and a contact person in the DCPS Division of Personnel (now Division of Human Resource Management). Space for planning and training were observed to be adequate. Survey and needs assessment forms were readied, as were evaluation instruments. Materials and supplies were available. Mathematics inservices, university courses and workshops were announced.

Six of the observed processes were in agreement with their intended counterparts while three had discrepancies. Agreement was found in the following processes: (1.) Organizing and presenting a symposium attended by local universities, businesses, professional organizations and DCPS staff to present ways to support and encourage the training and recruitment of mathematics teachers; (2.) Conducting mathematics needs assessment - these were done at the elementary, junior, and senior high schools and at all three levels computer use was at the top of the list in frequency; (3.) Planning a sequence of training which matched the identified needs; (4.) Offering courses for credit; (5.) Offering regional workshops; and (6.) Working with representatives of the DCPS Personnel Division in developing plans for recruitment and placement of mathematics teachers.

The processes in which there were discrepancies were as follows: (1.) The Mathematics Resource Teacher Trainer was unable to analyze mathematics DPI scores and CTBS scores to determine instructional needs of students in order to indicate inservice needs of teachers, due to other priority assignments; (2.) The Mathematics Department staff were unable to analyze inservice evaluation forms because they were mailed out and very few were returned - however, the project coordinator had a dialogue with instructors to gain general evaluation information; (3.) Time restraints prevented the Supervising Director of mathematics from designing a pilot study to measure the impact on students of the teacher training program.

There was agreement between the first intended and observed outcome and partial agreement on the second. The first outcome was concerned with the establishment of a Mathematics Teachers Training Program. A three year plan was developed beginning in 1983 and training proposals for both elementary and secondary mathematics teachers had been written and submitted for funding. The second outcome was concerned with the establishment of a mathematics teachers' recruitment program. Although no formal program has been established, several activities had occured to encourage recruitment into the teaching of mathematics. In addition to the processes listed above, posters on mathematics teaching as a career had been ordered from the Mathematical Association of American to be put in all DCPS high schools;

advisory group members from local universities were involved with the DCPS on active recruitment; the certification program was expanded to train more mathematics teachers; and a comprehensive plan for mathematics education was developed. With the planning and beginnings of the programs to train and recruit mathematics teachers, Objective A has been met.

Objective B - At least 90% of the teachers who attend the mathematics inservice training will demonstrate knowledge of the course content in the manner designated by the course instructor.

Objective B was concerned with demonstration of knowledge by teachers attending the mathematics inservice training. All observed inputs were in agreement with the intended inputs. In addition to project staff and course instructors, 167 teachers enrolled in courses and staff development through the Mathematics Resource Development Program. There were adequate space for classes, adequate materials and supplies and instruments designed to assess course performance.

All intended and observed processes were also in agreement. Course selection counseling was provided. Teachers participated in mathematics training including the improvement of their own competencies, the learning of strategies to foster increased mathematics competencies in their students and the identification of ways to decrease mathematics anxiety of teachers and students. Participants were evaluated on their knowledge of course content as designated by instructors.

The observed outcomes were in agreement with the intended ones. Between September, 1982 and June, 1983 the enrollment in 11 UDC mathematics courses totaled 92. All of those enrolled completed the courses satisfactorily and 61 teachers, taking one to three courses received certification credit. By demonstrating that teachers had acquired knowledge of the course content, Objective B was met.

## Conclusions

Although the designers of the Mathematics Teacher Resource Development program were not able to accomplish all of the processes they had set out to do, they did reach their objectives of establishing a Mathematics Teachers' Training and Recruitment program and of assuring that teachers attending training courses were able to demonstrate knowledge gained. Project personnel had hoped, also, to design a pilot study to measure the impact on students of the teacher training program, but time restraints prevented the study from being designed.

Although all ECIA Chapter 2 projects were late in starting up during this first year, this evaluation shows that much did occur in the shorter time allowed for completion, toward meeting the goal of increasing the capability of teachers to provide effective mathematics instruction to students, pre-K through 12th grade.

## Decisions

This report will be forwarded to the Project Director, Project Manager, LEA Chapter 2 Director, the Superintendent and the School Board to aid them in their decision-making concerning this project.

FINAL REPORT

PLANNING, MONITORING, AND IMPLEMENTING (PMI)
EVALUATION MODEL FOR DECISION-MAKING

Reporting Form

Goal: To increase the capability of teachers to provide effective mathematics instruction to students, pre-K through 12th grade.

Objective A: By June 1983, a Mathematics Teachers' Training Program and a Mathematics Teachers' Recruitment Program will be established in the District of Columbia Public Schools as evidenced by a report to be submitted to the Superintendent of Schools.

PART I

INPUTS

| INTENDED | STATUS | OBSERVED |
|---|---|---|
| - Project Manager | Agreement | - The position status was verified by project personnel. |
| - Supervising Director of Mathematics | Agreement | - The position status was verified by project personnel. |
| - Assistant Director for Resource Development | Agreement | - The position status was verified by project personnel. |
| - Mathematics Resource Teacher Trainer | Agreement | - The position status was verified by project personnel. |
| - Representatives of area universities, businesses, professional organizations, and District of Columbia Public Schools (DCPS) to be surveyed for training needs and recruitment support. | Agreement | - A list showing the names of advisory committee members was reviewed by members of the Evaluation Unit. |
| - D.C. Public Schools Personnel Department Staff | Agreement | - A contact person in the Personnel Department was designated to facilitate staffing. |

OBJECTIVE A

PART I (continued)

INPUTS

| INTENDED | STATUS | OBSERVED |
|---|---|---|
| - Adequate office (planning) space | Agreement | - Office and planning space was observed and verified as adequate. |
| - Adequate space for training | Agreement | - Training sessions were held at a variety of sites such as Langdon and Bunker Hill Elementary Schools, Bruce-Monroe Community School and Eliot Junior High School. Training space was observed and verified as adequate. |
| - Training support survey forms | Agreement | - Evaluation members reviewed training support surveys distributed to mathematics department chairpersons and teachers, dated 9/15/82. (See Appendix B.) |
| - Needs assessment form for mathematics teachers | Agreement | - A needs assessment form for elementary mathematics resource teachers and one for mathematics chairpersons were reviewed by evaluation team members. (See Appendix C.) |
| - Diagnostic Prescriptive Instrument (DPI) Comprehensive Tests of Basic Skills (CTBS) May, 1982 scores for analysis | Agreement | - The Teacher-Trainer verified that the scores were on record. |
| - Inservice evaluations | Agreement | - Mathematics inservice evaluation forms were reviewed by Evaluation team members. (See Appendix D.) |

OBJECTIVE A

PART I (continued)

INPUTS

| INTENDED | STATUS | OBSERVED |
|---|---|---|
| - Materials and supplies for courses | Agreement | - Project staff members stated that materials and supplies needed were available. Some were examined during course observations by the Evaluation Unit. |
| - Mathematics inservices, university courses, and workshops | Agreement | - Mathematics course outlines and course offering announcements were reviewed by Evaluation Unit members. (See Samples, Appendix E.) |

OBJECTIVE A

PART II

PROCESSES †

| INTENDED | STATUS | OBSERVED |
|---|---|---|
| 1a. The Assistant Director for Resource Development and staff will organize a symposium at which local universities, businesses, professional organizations and DCPS will present ways that they will support the training of mathematics teachers, grades pre-K through 12. | Agreement | 1a. A symposium was presented on February 5, 1983. (See Agenda, Appendix F.) The symposium summary report was reviewed by Evaluation Unit members on 3/9/83. |
| b. The Mathematics Resource Teacher Trainer will analyze mathematics DPI scores, and CTBS scores to determine instructional needs of students in order to indicate inservice needs of teachers. | Discrepancy | b. The teacher trainer who had planned to do this task was given other priority assignments and did not have time to complete this one. Teacher inservice needs were determined through questionnaires. |
| c. The Assistant Director for Resource Development and staff will conduct needs assessments to determine mathematics deficiencies and certification status of mathematics teachers. | Agreement | c. Needs survey analyses were submitted to the Evaluation Unit by the Project Coordinator for elementary, junior and senior high school teachers. (See Appendix G.) At all levels, computer use was at the top of the list in frequency and, thus, number 1 in priority. Other methods were used to determine classes in addition to the needs assessment. For example, the project coordinator talked to many mathematics teachers throughout the school district. Certification status was a little more difficult to assess because of the definition of "certified," but project personnel were able to determine that there was a need for teachers to have training for certification in mathematics. |

† Processes numbered to correspond with outcomes

OBJECTIVE A

PART II (continued)

PROCESSES †

| INTENDED | STATUS | OBSERVED |
|---|---|---|
| d. The Assistant Director for Resource Development and staff will identify a sequence of training for project participants which will match the needs identified by the needs assessment. | Agreement | d. According to the project coordinator, based upon response data of needs assessments, follow-up monthly meetings (in each region) were conducted to address the needs identified. Information from these meetings was used to plan mathematics training classes for project participants in each region. |
| e. Courses for university and recertification credit will be offered after school on site in the DCPS. | Agreement | e. The UDC mathematics course announcements were reviewed by Evaluation Unit members. Course participation was verified by enrollment records. |
| f. Workshops addressing specific skill needs or topics will be offered regionally, in designated schools, and at the Instructional Services Center as requested. | Agreement | f. The workshop announcements were reviewed by Evaluation Unit members. Course participation was verified by enrollment records. |
| g. Mathematics Department staff will analyze in-service evaluations submitted by participants. | Discrepancy | g. Inservice evaluation forms were mailed out but very few were returned. Verbal feedback was both positive and negative. The Director of Resource Development had a dialogue with the instructors to gain general evaluation information. |
| h. Supervising Director of Mathematics will design a pilot study to measure the impact on students of the teacher training program. | Discrepancy | h. Time contraints prevented the pilot study from being designed. |

† Processes numbered to correspond with outcomes

OBJECTIVE A

PART II (continued)

PROCESSES †

| INTENDED | STATUS | OBSERVED |
|---|---|---|
| 2. Representatives of the DCPS Personnel Department and Mathematics Department will develop a collaborative plan for joint recruitment and placement of mathematics teachers, the plan to be approved by Personnel Director and Mathematics Department Supervising Director. | Agreement | 2. Members of the Mathematics Department worked with members of the DCPS Personnel Division in developing plans for recruitment and placement of mathematics teachers. Letters were sent to terminated teachers concerning the retraining program. An implementation plan was jointly developed. (See Appendix H.) |

† Processes numbered to correspond with outcomes

OBJECTIVE A

PART III

OUTCOMES

| INTENDED | STATUS | OBSERVED |
|---|---|---|
| 1. By June 1983, data submitted to the ECIA Chapter 2 Evaluation Unit by the project manager, will show that a Mathematics Teachers Training Program has been established. | Agreement | 1. A Mathematics Teachers' Training Program in cooperation with UDC was established as evidenced by the three year plan that began in the spring of 1983 and extends through the summer of 1985 (see Appendix I) and by proposals submitted in the spring of 1983 as follows:<br><br>- a Training Program for Elementary Mathematics Specialists<br><br>- a Secondary Mathematics Teacher Certification and Retraining Program.<br><br>Cover sheets and abstracts for the proposals are shown in Appendix I. |
| 2. By June 1983, data submitted to the ECIA Chapter Evaluation Unit by the project manager will show that a Mathematics Teachers Recruitment program has been established. | Partial Agreement | 2. Although no formal program has been established, in addition to that for retraining teachers, activities have occurred to encourage recruitment into the teaching of mathematics. Some of the accomplishments from these activities are as follows:<br><br>- A symposium entitled, "The Shortage of Mathematics Teachers in the Washington, D.C. Public Schools was held on February 5, 1983. (See Appendixes F and J.) |

OBJECTIVE A

PART III (continued)

OUTCOMES

| INTENDED | STATUS | OBSERVED |
|---|---|---|
| 2. (continued) | | 2. (continued)<br><br>- Advisory group with members representing local universities are committed to recruitment. Most members also serve on the certification review committee.<br><br>- Four faculty members at UDC have become involved with the DCPS on certification and recruitment.<br><br>- Posters on mathematics teaching as a career have been ordered from the Mathematical Association of America to be put in all DCPS high schools.<br><br>- The certification program for DCPS teachers, has been opened to and has enrolled others, who pay their own tuition, to train to become mathematics teachers.<br><br>- A "Comprehensive Plan for Mathematics Education in the District of Columbia Public Schools" was developed by the Mathematics Department. It includes a summary of the problems and recommendations for addressing them. (See Appendix K.) |

EVALUATION DESIGN

PLANNING, MONITORING, AND IMPLEMENTING (PMI)
EVALUATION MODEL FOR DECISION-MAKING

Reporting Form

Goal: To increase the capability of teachers to provide effective mathematics instruction to students, pre-K through 12th grade.

Objective B: At least 90% of the teachers who attend the mathematics inservice training will demonstrate knowledge of the course content in the manner designated by the course instructor.

PART I

INPUTS

| INTENDED | STATUS | OBSERVED |
|---|---|---|
| - Project Manager | Agreement | - The position status was verified by project personnel. |
| - Supervising Director of Mathematics | Agreement | - The position status was verified by project personnel. |
| - Assistant Director for Resource Development | Agreement | - The position status was verified by project personnel. |
| - Mathematics Resource Teacher Trainer | Agreement | - The position status was verified by project personnel. |
| - Course Instructors | Agreement | - The position status was verified by project personnel. |
| - 60 elementary mathematics resource teachers | Agreement | - Forms completed by 120 resource teachers were reviewed on 3/9/83. |
| - 30 teachers of mathematics working for secondary mathematics teacher certification | Agreement | - Supervising director verified the number of teachers working for mathematics certification as 30. |
| - 20 secondary certified mathematics teachers seeking enrichment | Agreement | - The Assistant Director for Resource Development verified that 27 teachers requested enrichment courses. Since priority was given to non-certified teachers, there was only room left for 17 certified teachers. |

OBJECTIVE B

PART II (continued)

INPUTS

| INTENDED | STATUS | OBSERVED |
|---|---|---|
| - Adequate space for classes | Agreement | - The program staff verified space adequacy. Classes were held at Langdon and Bunker Hill. Evaluators observed that space was adequate. |
| - Adequate materials and supplies. | Agreement | - The project staff verified that materials and supplies were adequate. Some were examined by the Evaluation Unit. |
| - Instruments to assess course performance of participants as designated by instructors. | Agreement | - UDC course outlines indicated the course evaluation component. Instructors used teacher-constructed instruments, as verified by project staff. A sample of assessment instruments was examined by the evaluators. |

OBJECTIVE B

PART II

PROCESSES †

| INTENDED | STATUS | OBSERVED |
|---|---|---|
| 1a. Mathematics Department staff will provide individual counseling to teachers upon request, to assist them in course selection. | Agreement | 1a. Supervising director reported that teachers were contacted via telephone when counseling was needed. |
| b. Teachers will participate in inservice training. | Agreement | b. UDC course outlines described training components. Training classes were observed by the Evaluation Unit. Attendance records are on file. |
| c. Course instructors will present subject matter including: | | c. UDC course outlines described course content area. |
| (1.) material leading to the improvement of mathematics content competency of teachers, | Agreement | (1.) Teachers were observed receiving this subject matter. A Self-Evaluation and Needs Survey was used to help identify content areas of weakness. (See Appendix L.) |
| (2.) methods of developing strategies for teachers to help increase mathematics competencies of students, consistent with CBC instruction, | Agreement | (2.) Teachers were observed receiving this subject matter. |
| (3.) identification of ways to decrease mathematics anxiety of teachers and students. | Agreement | (3.) Teachers were observed receiving this subject matter. A Self-Evaluation and Needs Survey was used to identify teachers needing help in this area. (See Appendix L.) |

† Processes numbered to correspond with outcomes

OBJECTIVE B

PART II (continued)

| PROCESSES † | | |
|---|---|---|
| INTENDED | STATUS | OBSERVED |
| d. At the end of the inservice training, participants will be evaluated on their knowledge of course content as designated by instructors. | Agreement | d. UDC course outlines specified evaluation criteria. Other instructors verified that they had evaluation methods prepared. Some were observed. |

† Processes numbered to correspond with outcomes

OBJECTIVE B

PART III

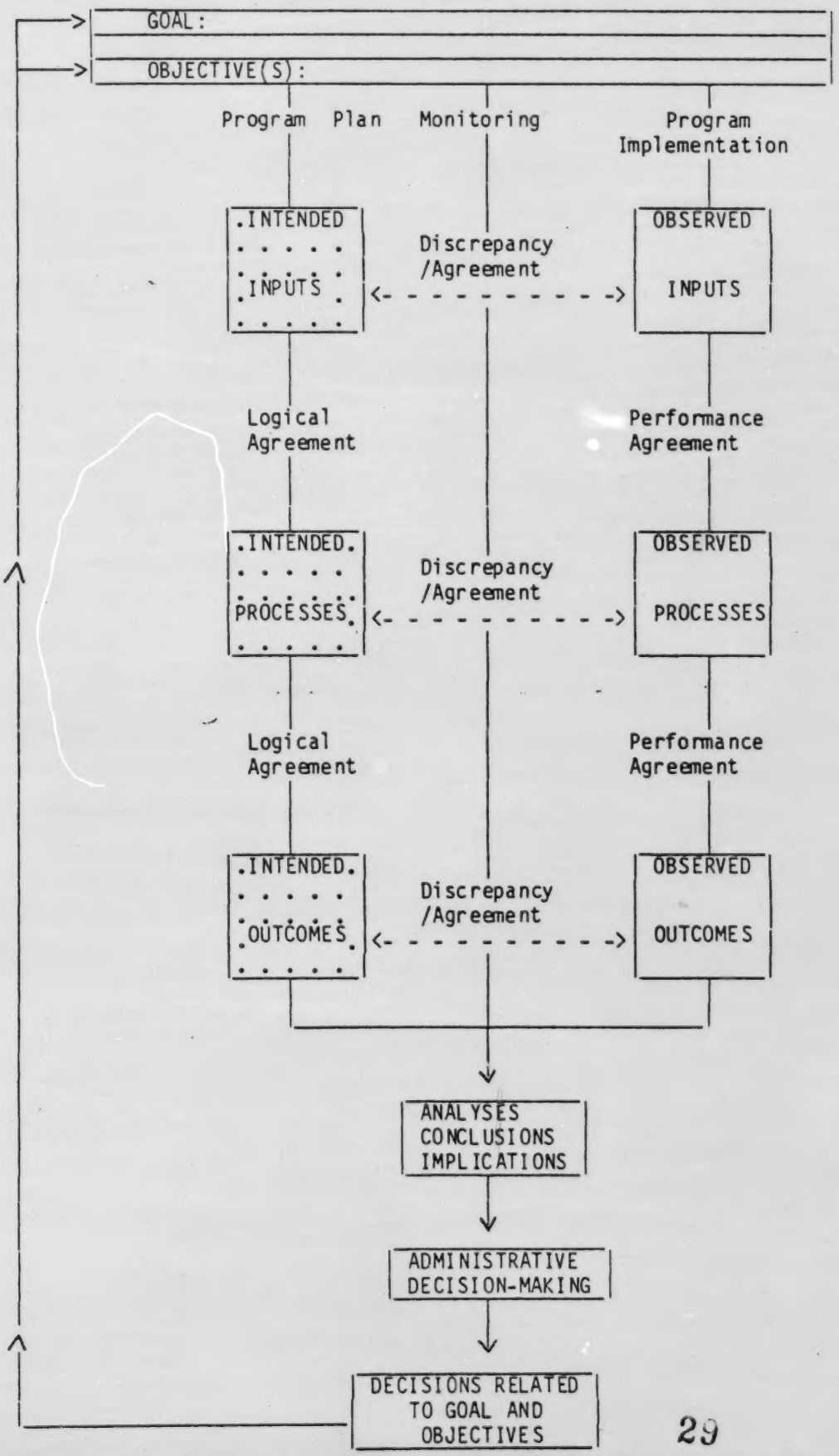
OUTCOMES

| INTENDED | STATUS | OBSERVED |
|---|---|---|
| 1a. By June 1983, data such as course grades, course test scores or samples of final projects submitted to the ECIA Chapter 2 Evaluation Unit by the project manager will show that at least 90% of the teachers who attended the inservice courses and workshops, demonstrated knowledge of course content acceptable to the instructor. | Agreement | 1a. Although individual course grades were confidential and not given out to the Mathematics Division by the UDC instructors, a list of names of teachers who had attended courses and earned credit, thus demonstrating course content acceptable to the instructor, was submitted. Of the 92 enrollees in the Certification Program courses, 92 (100%) demonstrated such knowledge. The teachers were enrolled in 11 courses between September, 1982 and June, 1983, covering six topics, ranging from "Fundamental Concepts of Mathematics" to "Calculus 1." (See Appendix M). |
| b. By June 1983, a listing of teachers earning certification credits will be submitted to the ECIA Chapter 2 Evaluation Unit by the project manager, to show increased knowledge of mathematics. | Agreement | b. A listing of teachers earning recertification credit, submitted to the ECIA Chapter 2 Evaluation Unit, showed that during the 1982-83 school year, 61 teachers had qualified for credit, having taken 1 to 3 courses during the year. |

# APPENDIX A

## EVALUATION MODEL SCHEMA

EVALUATION MODEL SCHEMA



APPENDIX B

TRAINING SUPPORT SURVEY FORMS

Please supply the following information:

School _____

Department Chairperson _____

Positions assigned to Mathematics Department _____

Vacant positions in Mathematics Department _____

Type of Mathematics Laboratory _____

Names of all teachers who teach one or more mathematics classes in your building:

| Name | Certified in Mathematics (Yes) or (No) | No. of Mathematics Classes Taught |
|---|---|---|
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Please return this form to: Gordon Lewis
Supervising Director of Mathematics
Instructional Services Center
Route #3

9/82

Name _____ School _____
Last First M.I.

Home Address _____ Region _____ Route _____
Street

_____ Home Phone _____
City and State Zip Code

Please check appropriate boxes:

|___| I am a DCCTM member

|___| I am a NCTM member

|___| I am a new DCPS teacher

|___| I am interested in courses for graduate credit

|___| I am interested in tutoring

|___| I have had a course in computer programming

|___| I am certified in secondary mathematics

|___| If not: I am interested in taking courses leading to certification

|___| I use the Scope and Sequence and Curriculum Guides

SCHOOL SCHEDULE

| PERIOD | COURSE | ROOM | TEXT TITLE | AUTHOR | COPYRIGHT DATE |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| | | | | | |

Describe what you believe to be the most pressing need of the DCPS mathematics program _____

_____

_____

|___| |___| |___| |___| |___| |___|

DCPS Math 9/82

APPENDIX C

NEEDS ASSESSMENT FORM FOR ELEMENTARY
MATHEMATICS RESOURCE TEACHERS

NEEDS ASSESSMENT

Elementary Mathematics Resource Teachers

Please circle the three topics which are of most interest to you.

Metric

Problem Solving

Classroom Use of Computers

Applications of Mathematics

Gifted and Talented

Testing

Development of Instructional Materials

Student Progress Plan

Mathematics Laboratories

Classroom Management

Use of Manipulatives

Individualized Instruction

Other: _____

_____

Would you be willing to conduct workshops on any of the above? _____

If so, which of the above? _____

_____

_____

DCPS Math 6/81

MATHEMATICS DEPARTMENT SURVEY

November 26, 1982

The checklist below can be used to identify the priority concerns your department would like to see addressed at a January Staff Development meeting for Mathematics Teachers. Add any items you wish to this list. WE NEED INPUT!

_____ 1. Departmental Team Building

_____ 2. Student Learning Groups

_____ 3. Mathematics Concept Attainment

_____ 4. Applications

_____ 5. Problem-Solving

_____ 6. Instructional Strategies

_____ 7. Course Sequencing

_____ 8. Student Placement

_____ 9. Geometry in the Junior and Senior High School Curricula

_____ 10. _____

_____ 11. _____

_____ 12. _____

_____ 13. _____

_____ 14. _____

Any comments or recommendations:

Send this form to your REGIONAL SUPERVISOR before DECEMBER 10, 1982.

APPENDIX D

MATHEMATICS INSERVICE EVALUATION FORM

INSERVICE COURSE EVALUATION

Please complete this evaluation so that we can better design future courses to service the needs of teachers.

Name _____ School _____ Route # _____

Course Name _____ Instructor _____

Use a scale of 1 to 5 (1=Low; 5=High) to rate the following:

___ 1. How well the course met your expectations.
comments

___ 2. Your learning of subject matter
comments

___ 3. Usefulness of the course to you
comments

___ 4. Capability of the instructor
comments

___ 5. Your motivation to complete the course work.

---

6. What was MOST helpful to you in the course?

7. What was LEAST helpful to you in the course?

8. What was MISSING for you in the course?

9. What about the course would you CHANGE?

10. Other comments about the course!!

!! Please mail to ADDRESS ON REVERSE SIDE OF THIS FORM !!

APPENDIX E

SAMPLES OF MATHEMATICS COURSE
OUTLINE AND COURSE OFFERINGS

COURSE OUTLINE

UNIVERSITY OF THE DISTRICT OF COLUMBIA

Name of Course: PROBLEM SOLVING AND MATHEMATICAL REASONING - M599-11
3 Graduate Credits
Doris D. Quander

Course Description and Purpose:

It is the recommendation of the National Council of Teachers of Mathematics that problem solving be the major focus of school mathematics. This course is an attempt to help the classroom teacher in this important effort through the improvement of the teacher's competency in problem-solving. It also focuses on strategies and ideas to be adapted to specific levels of instruction. Its open framework is the background preparation of the participants, through problem-solving skill development, examples, and illustrations.

Specific Objectives:

Upon completion of this course, each participant should be able to:

1. Identify the types and levels of problems relevant to school mathematics and other academic experiences.

Apply a variety of theories about problem solving and reasoning in mathematics in solving mathematics problems.

Apply a plan of heuristics she/he developed, in problem solving and instructional planning of problem solving experiences.

Demonstrate increased competency in arithmetic, computation, algebra, and geometry as a result of applying them in problem solving experiences.

Consult, critique, and apply professional literature to enhance problem solving skills in mathematics.

Apply his/her own learnings to design specific instructional strategies which may be used to help students learn problem solving skills at various levels.

Utilize problem solving as an integral part of lesson planning, to motivate and develop increased computational and reasoning skills.

Course Time Schedule:

Ten four-hour weeks

Dates: January 17 - March 25, 1983

First Week:

- Course Overview
- Class Assessment of Mathematics and Problem-solving Skills
- Problem Solving Theories

Second Week:

- Types and Levels of Classroom Problems (Mathematics)
- Comparisons and Illustrations from Other Academic Disciplines
- Comparisons and Illustrations from Outside (of the classroom)
- Improving Mathematics for Problem-solving Skills

Third Week:

- Problem Solving Heuristics
- Problem Solving As a Process
- Stating Problems Properly
- Mathematics for Problem-solving

Fourth Week:

- Research and Resources for Classroom Instruction
  (from George Polya, NCTM, et al)
- Approaches and Strategies for Classroom Instruction
  (with emphasis on CBC)
- Mathematics for Problem-solving

Fifth Week:

- Using and Supplementing Textbook Problems
- Making Routine Problems Come Alive
- Mathematics for Problem-solving

Sixth Week:

- Special Projects or Reports (Assigned)
- Non-routine Problems and Strategies
- Common and Uncommon Heuristics
- Mathematics for Problem-solving

Seventh Week:

- Problem Solving Using the Calculator
- Mathematics and Problem-solving

Eighth Week:

- Strategy Games and Mathematical Reasoning

Ninth Week:

- Special Projects and Reports
- Mathematics and Problem-solving

Tenth Week:

- Special Projects and Reports
- Post-assessment in Mathematics and Problem-solving
- Course Wrap-up

Course Materials:

1. NCTM Yearbook, 1980 (PROBLEM SOLVING IN SCHOOL MATHEMATICS)
2. PROBLEM SOLVING, A HANDBOOK FOR TEACHERS (Allyn Bacon, Inc.)
3. Classroom Textbooks
4. D.C. Public Schools Competency Based Curriculum Guides for Mathematics

Course Evaluation:

Evaluation will be directed by the course objectives. Participants will be asessed regarding their problem-solving skills, pedagogical skill and flexibility with each involvement.

November 3, 1982

MEMORANDUM TO: Elementary Mathematics Resource Teachers

SUBJECT: Staff Development Schedule

Based upon the results of the needs assessment administered at our last meeting, the following tentative schedule of staff development topics for our future monthly meetings has been established:

| | |
|---|---|
| November 16, 1982 | Classroom Use of Computers |
| December 21, 1982 | Interpersonal Skills Applications |
| January 18, 1983 | Problem Solving/Applications of Mathematics |
| February 15, 1983 | How to Conduct Staff Development Sessions |
| March 15, 1983 | Mathematics Laboratories, Metrics, and Manipulatives |
| April 19, 1983 | Testing Programs: Interpretation and Applications |
| May 17, 1983 | Gifted and Talented Projects |
| June 21, 1983 | End-of-Year Activities |

The exact times and locations for these sessions will be sent to you as part of the monthly meeting reminders. We look forward to seeing you there.

Gordon Lewis
Supervising Director, Mathematics

cc: Principals

THE UNIVERSITY OF THE DISTRICT OF COLUMBIA IS OFFERING

# M A T H E M A T I C S  C O U R S E S

FOR TEACHERS

ON-SITE IN THE SCHOOLS

JANUARY 17 through MARCH 25, 1983
4:00 to 6:00 p.m.

3:30-4:30 p.m.
Registration: January 11, 1983
at Instructional SErvices Center
Langdon School
20th & Evarts/ Franklin N.E.

| | courses 3 credits | meeting dates | cost |
|---|---|---|---|
| SCHOOL SITE | For secondary teachers | | |
| Bunker Hill | 1. Precalculus with Trigonometry 1 M113 | Tues. & Thurs | $123. |
| Bruce-Monroe | 2. Precalculus with Trigonometry 2 M114 | Tues. & Thurs | $123. |
| Logan Com. Sch. | 3. Calculus 1 M 151 | Tues. & Thurs | $123. |
| | For elementary teachers | | |
| Bunker Hill | 4. Fundamental Concepts in Mathematics 2 | Mon. & Wed. | $141 |
| Bunker Hill | 5. Problem-solving M 175 | Mon. & Wed. | $123. |

Ten students must sign up for a course in order for it to be held.
Site To Be Announced Later

Tear off the bottom section of this announcement and mail to:

---

Dr. Bessie C. Howard
Math Dept, Instructional Services Center
20th and Franklin Streets, N.E.
Washington, D.C. 20018 ROUTE #3

RETURN THIS FORM BY
JANUARY 7, 1983

Check the course(s) in which you would like to enroll:

___1. Precalculus with Trigonometry 1 M113

___2. Precalculus with Trigonometry 2 (prerequisite is M 113) M114

___3. Calculus 1 M 151

___4. Fundamental Concepts in Mathematics 2 M599-06

___5. Problem-solving for Elementary Teachers M 175

Name_____ _____
Address

Telephone _____ _____
Zip Code

_____
School at which you are teaching

APPENDIX F

AGENDA FOR SYMPOSIUM ON THE SHORTAGE OF
MATHEMATICS TEACHERS IN THE
D.C. PUBLIC SCHOOLS

SYMPOSIUM
THE SHORTAGE OF MATHEMATICS TEACHERS
IN THE WASHINGTON, D.C. PUBLIC SCHOOLS

Saturday, February 5, 1983
Shiloh Family Life Center
Washington, D.C. 20001

AGENDA

9:00 a.m. — Registration/Coffee

9:30 a.m.
Heritage Hall Center — Opening: Dr. Bessie Howard, Chairman
Symposium Planning Committee

Greetings: Floretta Dukes McKenzie, Superintendent
D.C. Public Schools
Chief State School Officer

Dr. Broadus Butler, Acting Vice President
for Academic Affairs
University of the District of Columbia

Dr. Lorraine Williams
Vice President of Academic Affairs
Howard University

10:00 a.m.
Heritage Hall Center — FORUM: Shortage of Certified Mathematics Teachers

Moderator: Dr. James Donaldson

Panel I — Administrators & Supervisors

Panel II — Secondary School Mathematics Teachers in the D.C. Public Schools

Panel III — University Professors

Panel IV — Former Mathematics Teachers currently in other positions

12:00 — BREAK .....

12:15
Heritage Hall North — LUNCH
Introduction of Keynote Speaker
Dr. Beverly J. Anderson

Keynote Speaker: Dr. J. Arthur Jones, Director
Program Analysis Office
National Science Foundation

Presentations of Intervention Programs

1:30 p.m.

Worksessions*

Session I - D.C. Public Schools - Student Programs
General Lounge/Second Floor

Session I - D.C. Public Schools - Teacher Programs
Multi-Purpose Room/Second Floor

Session III - University
Arts & Crafts Room
Second Floor

Session IV - Government
Games Room/Second Floor

Session V - Private Sector - Business, Church, Civic and Professional Organization
Heritage Hall Center

*Worksession Task: To make recommendations, outline proposals and identify strategies and resources to alleviate the shortage of certified mathematics teachers and the problems resulting from the shortage

3:30 p.m.
Heritage Hall Center

Groups Reports

4:00 p.m.
Heritage Hall North

Reception
Courtesy of: Holt, Rinehart & Winston Publishing Company/Harcourt, Brace and Jovanovich Publishing Company

**********

APPENDIX G

NEEDS SURVEY RESULTS - ELEMENTARY, JR. AND
SR. HIGH SCHOOL MATHEMATICS TEACHERS

Needs Survey Analysis

Elementary Mathematics Resource Teachers

N=27

| Priority | Frequency | Topic |
|---|---|---|
| 1 | 14 | Classroom use of computers |
| 2 | 7 | Problem Solving & Reasoning |
| 3 | 6 | Gifted & Talented |
| 4 | 5 | Applications of Mathematics |
| | 5 | Mathematics Laboratories |
| | 5 | New Approaches to Teaching Basics |
| 7 | 4 | Providing Support to Building Teachers |
| 9 | 3 | Geometric Models |
| | 3 | Leadership Skills for the EMRT |

Needs Survey Analysis

Junior High School Mathematics Teachers

N=57

| Priority | Frequency | Topic |
|---|---|---|
| 1 | 51 | Computers and the Math Curriculum |
| 2 | 22 | Connecting Math with other subject area curricula |
| 3 | 14 | Mathematics of Chance: Living Lottery |
| 4 | 13 | Higher Mathematics Concepts to Enhance Lower Level Curriculum |
| 5 | 10 | Identifying & Utilizing Mathematics Resources in the Community |
| | 10 | Motivating Higher Level Cognitive Skills |
| 7 | 9 | Students Learning Teams: The Johns Hopkins Model |
| | 9 | Problem-solving: Rational & Irrational |
| | 9 | New Ways to Look at Algebra & Geometry: Functions & Graphs |
| | 9 | Deduction & Induction: A Way of Thinking |
| | 9 | Statistics in the Classroom |
| 12 | 8 | Topology Topics |

Needs Survey Analysis

Senior High School Mathematics Teachers

N=51

| Priority | Frequency | Topic |
|---|---|---|
| 1 | 37 | Computers and the Math Curriculum |
| 2 | 26 | New Ways to Look at Algebra & Geometry: Functions & Graphs |
| 3 | 18 | Connecting Math with other subject area curricula |
| 4 | 16 | Higher Mathematics Concepts to Enhance Lower Level Curriculum |
| 5 | 15 | Identifying & Utilizing Mathematics Resources in the Community |
| 6 | 14 | Motivating Higher Level Cognitive Skills |
| 7 | 12 | Mathematics of Chance: Living Lottery |
| | 12 | Statistics in the Classroom |
| | 12 | Students Learning Teams: The Johns Hopkins Model |
| 10 | 10 | Topology Topics |

Needs Survey Analysis

Secondary (Senior & Junior High) School

Mathematics Teachers

N=108

| Priority | Frequency | Topic |
|---|---|---|
| 1 | 87 | Computers and the Math Curriculum |
| 2 | 40 | Connecting Math with other subject area curricula |
| 3 | 35 | New Ways to Look at Algebra & Geometry: Functions & Graphs |
| 4 | 29 | Higher Mathematics Concepts to Enhance Lower Level Curriculum |
| 5 | 25 | Identifying & Utilizing Mathematics Resources in the Community |
| | 25 | Mathematics of Chance: Living Lottery |
| 7 | 24 | Motivating Higher Level Cognitive Skills |
| 8 | 21 | Statistics in the Classroom |
| | 21 | Students Learning Teams: The Johns Hopkins Model |

APPENDIX H

RECRUITMENT AND PLACEMENT PLAN DEVELOPED
JOINTLY BY DEPARTMENT OF MATHEMATICS
AND DIVISION OF PERSONNEL

District of Columbia Public Schools

Office of Financial Management,
Data Systems and Planning

Division of Personnel

June 2, 1983

MEMORANDUM to: Mr. Gordon Lewis
Director
Department of Mathematics

SUBJECT: Meeting

This is a follow-up to the meeting Mr. Roanld Webb had with you and Ms. Bessie Howard on Wednesday, May 11, 1983.

Following are the items which were discussed at the meeting:

- Need for recruitment of qualified mathematics teachers
- Training programs currently available through the Department of Mathematics
- Establishment of communication lines between the Division of Personnel and the Mathematics Department
- Problems with the use of teachers in schools, i.e. teachers certified in other areas teaching mathematics courses.

It was suggested that we implement the following precedures for 1983-84 school year:

- Secondary staffing would provide the Mathematics Department with a listing of all temporary teachers being terminated as of June/August 30, 1983
- The Mathematics Department would meet with these individuals to inform them of training courses available.
- Prior to hiring temporary mathematics teachers for school year 1983-84, the Mathematics Department would interview the potential candidate and provide a recommendation to the Division of Personnel.
- A staff development training schedule would be established by the Mathematics Department.

I am pleased that we will be able to coordinate efforts to improve the quality of teaching being offered by temporary mathematics teachers. As in the past, the Division of Personnel will continue efforts to recruit and employ fully qualified teachers.

If you feel additional dialogue is needed regarding the hiring process of mathematics teachers, please contact me.

Mary B. Hendrick
Director of Personnel

MBH:mb

cc: Dr. James Guines

APPENDIX I

THREE YEAR TRAINING PLAN AND
PROPOSAL ABSTRACTS FOR MATHEMATICS
TEACHERS TRAINING PROGRAM

If you desire to continue as a participant in the Secondary Mathematics Teacher Certification Program this coming year, tution free, you will be interested to know that the following courses will be offered. You may enroll in any of them depending on your entry level needs.

| | | Credits |
|---|---|---|
| Fall 1983 | | |
| Mon & Wed | Precalculus with Trigonometry 1 M 113. | 3 |
| | Linear Algebra M 225 | 3 |
| Tues & Thurs | Calculus 1 M 151 | 4 |
| | Calculus 2 M 152 | 4 |
| Spring 1984 | | |
| Mon & Wed | Precalculus with Trigonometry 2 M 114 | 3 |
| | Calculus 2 M 152 | 4 |
| Tues & Thurs | Probability & Statistics for Teachers M551 | 3 |
| Summer 1984 | | |
| | Geometry Institute M 431 | 3 |
| Fall 1984 | | |
| Mon & Wed | Calculus 1 M 151 | 4 |
| | Calculus 3 M 253 | 4 |
| Tues & Thurs | Linear Algebra M 225 | 3 |
| | Precalculus with Trigonometry 1 M 113 | 3 |
| Spring 1985 | | |
| Mon & Wed | Probability & Statistics for Teachers M 551 | 3 |
| | Computer Mathematics M 495 | 3 |
| Tues & Thurs | Precalculus with Trigonometry 2 M 114 | 3 |
| | Calculus 2 M 152 | 4 |
| Summer 1985 | | |
| | Geometry Institute M 431 | 3 |
| | Linear Algebra M 225 | 3 |

| | Late Spring May 5–June 30 | Summer 1983 Institute | Fall 1983 | MASTER SCHEDULE Spring 1984 | Summer 1984 Institute | Fall 1984 | Spring 1985 | Summer 1985 |
|---|---|---|---|---|---|---|---|---|
| 9a.m.-11:30a.m. | | Geometry Math 431 | | | .Computer Literacy and Problem Solving/Math | | | Geometry Math 431 |
| 12:30p.m.-3p.m. | | Inservice | | | .Inservice | | | Inservice |
| 4p.m.-6p.m.<br>M & W | 4p.m.-7p.m.<br>.Calculus 1 Math 151<br>.Calculus 11 Math 152 | | .Linear Algebra Math 225<br>.Precalculus with Trig. 1 Math 113 | .Precalculus with Trig. 11 Math 114<br>.Calculus 11 Math 152 | | .Calculus 1 Math 151<br>.Calculus 111 253 Math | .Probability and Stasistics for Teachers Math 551<br>.Computer Literacy Math 495 | .Linear Algebra Math 225 |
| 4p.m.-6p.m.<br>T & Th | 4p.m.-7p.m.<br>.Precalculus with Trig. 11 Math 114 | | .Calculus 1 Math 151<br>.Calculus 11 Math 152 | .Probability and Statistics for Teachers Math 551<br>.Linear Algebra Math 225 | | .Linear Algebra Math 225<br>.Precalculus with Trig. 1 Math 113 | .Precalculus with Trig. 11 Math 114<br>.Calculus 11 Math 152 | |

(Cover Sheet and Abstract)

# A PROPOSAL

# A TRAINING PROGRAM

# FOR

# ELEMENTARY MATHEMATICS SPECIALISTS

Submitted by
Carrie M. Kendrick, Ed.D.
Associate Professor of Mathematics
University of the District of Columbia

Beverly J. Anderson, Ph.D.
Chairman-Department of Mathematics
University of the District of Columbia

May 16, 1983

Abstract

The Training Program for Elementary Mathematics Specialists represents the dynamics of the Department of Mathematics at the University of the District of Columbia and the Mathematics Department of the District of Columbia Public Schools in responding to the needs of elementary school teachers of mathematics in the D. C. Public Schools. The program is designed to prepare inservice elementary school teachers in the D. C. Public Schools to teach mathematics at the elementary level.

The objectives of the program are (1) to develop competence in mathematics content needed to teach effectively at the K-6 level; (2) to develop the computer literacy needed by modern elementary mathematics teachers; (3) to develop competence in writing, selecting and solving word problems; (4) to develop skills in designing learning sequences and selecting strategies appropriate for mathematics at the K-6 level; (5) to develop skills in coordinating learning styles and teaching strategies; (6) to reduce mathematics anxiety; (7) to provide coursework necessary for certification as an Elementary Mathematics Resource Teacher in the D. C. Public Schools; (8) to develop skills in the design of assessment tasks, instructional activities and materials and (9) to develop skills in leading inservice workshops for classroom teachers.

Priority for admission into the program will be given to elementary mathematics resource teachers in the D. C. Public Schools who have not met certification requirements.

The program is designed to be completed in a maximum of two academic years of part-time study plus two summers.

This school-based program will be under the direction of the Unversity of the District of Columbia. During the academic year, courses will be taught by UDC professors in the evenings, generally from 4:00 p.m. until 6:00 p.m. During the academic year, the D. C. Public Schools Mathematics Department will conduct support seminars to reinforce the utilization of content and the development of strategies for classroom instruction. During the Summer Institute, UDC professors will teach from 9-11:30 a.m. and public school personnel will provide inservice training from 12:30-3:00 p.m.

The program will be evaluated by elementary school principals in the D. C. Public Schools, the UDC professors engaged in the program and the teachers participating in the program. An external evaluation of the program will be conducted each year.

Required courses (hours carried)

1) Fundamental Concepts of Mathematics I (3)
2) Fundamental Concepts of Mathematics II (3)
3) Geometry for Elementary School Teachers (3)
4) Probability and Statistics for Elementary School Teachers (3)
5) Computer Literacy for Elementary School Teachers
6) Problem Solving for Elementary School Teachers
7) Teaching Mathematics in the Elementary Schools

Elective Courses

Advanced students my select graduate courses in mathematics with the approval of the Program Director.

Suggested Electives

History of Mathematics (3)
History of Teaching Mathematics (3)

(Cover Sheet and Abstract)

A PROPOSAL

FOR

# A SECONDARY MATHEMATICS TEACHER CERTIFICATION AND RETRAINING PROGRAM

Submitted by
Beverly J. Anderson, Ph.D.
Chairman-Department of Mathematics
University of the District of Columbia

Bessie C. Howard, Ph.D.
Assistant for Resource Development Mathematics
District of Columbia Public Schools

April 22, 1983

A Secondary Mathematics Teacher
Certification and Retraining Program

Abstract

The Department of Mathematics at the University of the District of Columbia and the District of Columbia Public Schools are well aware that secondary school teachers of mathematics must know the content of mathematics far beyond that which they may teach and further that these teachers must be equipped with strategies to teach mathematics to students of varying abilities. The Departments are keenly aware that some teachers of mathematics are weak in the content area of mathematics and lack skills in instruction. Hence, we have devised an evening and summer program in mathematics that will address the academic needs of the secondary school teachers of mathematics in the D. C. Public Schools while equipping them with knowledge and strategies in teaching mathematics.

The program is designed to 1) afford public school teachers an opportunity to become better educated in the field of mathematics 2) give the local students in the secondary schools an opportunity to receive better instruction in mathematics 3) develop awareness of instructional strategies and resources in the teaching of mathematics 4) reduce mathematics anxiety and 5) produce certified teachers of mathematics.

Priority of admission into the program will be given to teachers of secondary mathematics who have not met the certification requirements of the D. C. Public Schools for secondary school teachers of mathematics and public school teachers who are not teaching mathematics but who are interested in becoming certified as secondary school mathematics teachers in the D. C. Public Schools.

The program is designed to be completed in a maximum of two academic years of part-time study plus two summers. Teachers beginning the program in the summer of '83 at the lowest level could complete the program by the summer of '85. These teachers would have satisfied the mathematics course requirements of certification in the D. C. Public Schools.

This school-based program will be under the direction of the University of the District of Columbia and the D. C. Public Schools. During the academic year, courses will be taught by UDC professors in the evenings, generally from 4:00 p.m. until 6:00 p.m. During the academic year, the D. C. Public Schools Mathematics Departments will conduct support seminars to reinforce the utilization of content and the development of strategies of classroom instructions. During the Summer Institute, UDC professors will teach from 9-11:30 a.m. and public school teachers will provide inservice training from 12:30 p.m. until 3:00 p.m.

The program will be evaluated by principals and mathematics Department chairpersons in the secondary schools in D. C., the UDC professors engaged in the program and the teachers participating in the program. An external evaluation of the program will be conducted each year.

APPENDIX J

COMMITTEES OF THE SYMPOSIUM ON THE
SHORTAGE OF MATHEMATICS TEACHERS IN
THE DISTRICT OF COLUMBIA PUBLIC SCHOOLS

THE SHORTAGE OF MATHEMATICS TEACHERS
IN THE WASHINGTON, D.C. PUBLIC SCHOOLS

Saturday, February 5, 1983
Shiloh Family Life Center
Washington, D.C. 20001

Planning Committee

Dr. Beverly J. Anderson
Chairman - Department of Mathematics
University of the District of Columbia

Dr. James Donaldson
Chairman - Department of Mathematics
Howard University

Dr. Bessie Howard
Director of Resource Development
D.C. Public School

Facilitators & Recorders

Ms. Vivian Carson
Associate Supervisor of mathematics
D.C. Public Schools

Ms. Barbara Clark
Region C Supervisor
D.C. Public Schools

Dr. Douglas DePriest
Statistician
Office of Naval Research
Arlington, Virginia

Mr. Joseph Harris
Training Specialist
Mathematics Department
D.C. Public Schools

Ms. Sandra Legall
Region B Supervisor
D.C. Public Schools

Facilitators & Recorders (continued)

Mr. Gordon Lewis
Supervisor of Teachers of Mathematics
D.C. Public Schools

Ms. Gwendolyn Means
Region D Supervisor
D.C. Public Schools

Ms. Elaine Melmed
Executive Director
Metropolitan Educational Council for Staff Development
Washington, D.C.

Ms. Lillie Parker
Region A Supervisor
D.C. Public Schools

Ms. Doris Quander
President
D.C. Council of Teachers of Mathematics

S * Y * M * P * O * S * I * U * M

THE SHORTAGE OF MATHEMATICS TEACHERS IN THE
WASHINGTON, D.C. PUBLIC SCHOOLS

ADVISORY COMMITTEE

Dr. Ruth Bari
Professor of Mathematics
George Washington University

Dr. Philip L. Brach, Dean
College of Physical Science,
Engineering and Technology
University of the District of Columbia

Dr. George Butcher
Professor of Mathematics
Howard University

Ms. Vivian Carson
Assistant Director of Mathematics
District of Columbia Public Schools

Dr. Julia Clark
Professor of Mathematics Education
Howard University

Dr. Winson Coleman
Professor of Mathematics
University of the District of Columbia

Ms. Linda Cropp
Education Committee Chair
Board of Education
District of Columbia Public Schools

Dr. Gloria Gilmer
Associate & Program Officer
National Institute of Education

Dr. Mary Gray
Professor of Mathematics
American University

Dr. James T. Guines
Associate Superintendent
Office of Instruction
District of Columbia Public Schools

ADVISORY COMMITTEE (continued)

Mr. Joseph R. Harris
Training Specialist in Mathematics
District of Columbia Public Schools

Dr. William T. Howard, Dean
School of Education
Howard University

Mr. Gordon Lewis
Supervising Director of Mathematics
District of Columbia Public Schools

Ms. Elaine Melmed
Executive Director
Metropolitan Educational Council for
Staff Development

Ms. Doris Quander
President
D.C. Council of Teachers of Mathematics

Mr. William Rice
Professor of Mathematics
University of the District of Columbia

Mr. William Simons
President
American Federation of Teachers

Dr. Barbara L. Smith, Dean
College of Education & Human Ecology
University of the District of Columbia

Dr. Sandra N. Smith
Chairman
Department of Curriculum & Teaching
Howard University

Dr. Dorothy Stephens
Director Instructional Srevices Center
District of Columbia Public Schools

APPENDIX K

COMPREHENSIVE PLAN FOR MATHEMATICS
EDUCATION IN THE DCPS

# COMPREHENSIVE PLAN FOR MATHEMATICS EDUCATION

# IN THE

# DISTRICT OF COLUMBIA PUBLIC SCHOOLS

## OVERVIEW AND SUMMARY

Submitted by:
Mathematics Department
Instructional Services Center
June, 1983

OVERVIEW AND SUMMARY OF A COMPREHENSIVE PLAN FOR MATHEMATICS EDUCATION

IN THE DISTRICT OF COLUMBIA PUBLIC SCHOOLS

PROBLEMS:

The major problem confronting mathematics education in the District of Columbia Public Schools is the LOW ACADEMIC ACHIEVEMENT OF STUDENTS as indicated by national norm comparisons, and course grades given to students by teachers.

Three problems which contribute to this LOW ACHIEVEMENT ARE:

1. Inadequate numbers of certified teachers of secondary mathematics in the District of Columbia Public Schools;
2. An inadequate quality of instruction in elementary and secondary mathematics, as demonstrated by non-adherence to the curriculum or guidelines proposed by the National Council of Teachers of Mathematics; and
3. Student disaffection with mathematics.

The following summary describes the major factors contributing to the continuation of these problems, and recommendations for activities, programs, and policies that would address their resolution. It is recognized that these problems are interdependent, so that recommendations may appear repetitious, though they are included where the impact may be greatest.

These recommendations are also made with an understanding, based on current research, of what impacts on the achievement of students in mathematics: the influences of teacher attitudes and competence; parent values; and instructional strategies that motivate.

PROBLEM #1: Inadequate numbers of certified teachers of secondary mathematics in the D.C. Public Schools.

| Factors contributing to the problem: | Recommendations for addressing the problem |
|---|---|
| 1.1 College mathematics students going into other careers for economic and status reasons. | 1.1.1 Consideration of policy that would increase the pay of teachers of mathematics in the D.C. Public Schools, to a more competitive level with other careers. |
| | 1.1.2 Increase recruitment activities at colleges and universities for mathematics teachers. |
| | 1.1.3 Student loan programs for prospective D.C. Public School mathematics teachers |
| 1.2 Mathematics teachers leaving the school system to enter other professions, primarily for economic reasons. | 1.2.1 Pay rewards for teachers who provide extra-curricular math programs for students. |
| | 1.2.2 See 1.1.1 |
| 1.3 Residency requirements for D.C. Public School teachers. | 1.3 Remove residency requirements for mathematics teachers in order to reach possible teachers in Virginia and Maryland. |
| 1.4 Higher certification requirements in the District than in surrounding areas. | 1.4 Approve the new certification requirements recommended by the advisory group for mathematics certification. (October, 1982) |
| 1.5 Excessive costs to teachers for acquiring certification at a university. | 1.5 Approve recommended certification program with the University of the District of Columbia (UDC) that would pay tuition and other costs for training. This is a two year certification proposal. (Attachment 2) |

PROBLEM #1 (con't) (Inadequate numbers of certified mathematics teachers)

| Factors contributing to the problem: | Recommendations for addressing the problem |
|---|---|
| 1.6 Lack of penalty for NOT being enrolled in a certification process. | 1.6.1 A policy that teachers not enrolled in some certification process will be replaced by teachers who are successfully enrolled. |
| | 1.6.2 Institute a Probationary Under Contract status for teachers who are successfully (passing all requirements) enrolled in a certification process. This status would permit pay advancement beyond level 6. |
| 1.7 Possible certified teachers unable to teach full-time. | 1.7 Recruit and hire part-time certified mathematics teachers from government, universities, professional organizations and businesses. |

PROBLEM #2: Inadequate instruction in mathematics-secondary and elementary

| Factors contributing to the problem: | Recommendations for addressing the problem |
|---|---|
| 2.1 Large numbers of uncertified Elementary Mathematics Resource Teachers EMRT). | 2.1.1 D.C. Public School- UDC Program which leads toward certification as an EMRT.<br>2.1.2 Release time for training EMRTs.<br>2.1.3 Use certified EMRTs as trainers of others. |
| 2.2 Elementary Mathematics Resource Teachers not being used, sufficiently, as on-site teacher trainers in mathematics. | 2.2.1 Policy identifying the use of EMRTs as on-site teacher trainers, and not solely as teachers of remedial mathematics for students. A definite schedule of teacher training identified for each building.<br>2.2.2 More extensive training of EMRTs to increase their capability of providing on-site training of regular<br><br>classroom teachers:<br>- Provide workshops & inservice for EMRTs<br>- provide handbook for EMRTs.<br>- regularly scheduled meetings with mathematics department personnel to identify needs of teachers in the schools.<br>_ establish a "support system" between EMRTs. |

PROBLEM #2 (con't) (Inadequate instruction in mathematics-elementary and secondary)

| Factors contributing to the problem: | Recommendations for addressing the problem |
|---|---|
| 2.3 Intermediate grade mathematics instruction not at an adequate level for entry to the secondary program. | 2.1.1 Increase mathematics background requirements for grades 4-6 teachers with competency checks.<br>2.3.2 Provide mathematics teachers in schools for grades 4-6.<br>2.3.3 Provide university inservice courses and require teachers in grades 4-6 to test out of or take the courses that enable them to teach the grades 4-6 curriculum effectively.<br>2.3.4 Provide regionally-based mini-seminars to help teachers master specific single skills in math content and instruction. Teachers to be referred to seminars on the basis of need. (Attachment 5) |
| 2.4 Inadequate resources for proper supervision and support in mathematics. | 2.4 Appoint elementary supervisors in <u>each region</u> who would also work with the Mathematics Department and with EMRTs. |

PROBLEM #2 (con't) (Inadequate instruction in mathematics-elementary and secondary)

| Factors contributing to the problem: | Recommendations for addressing the problem |
|---|---|
| 2.5 Large numbers of out-of-field teachers of mathematics without training in the teaching of mathematics or in mathematics content adequate for teaching at the secondary level. (Attachment 6) | 2.5.1 Encouragement of teachers to enroll in a mathematics teaching training program.<br>2.5.2 Required inservice training for all teachers teaching at least one mathematics course.<br>2.5.3 Pre-assessment of teacher ability to pass the competencies required of students in the courses they teach.<br>2.5.4 School administrators required to request mathematics teachers commensurate with the number of mathematics courses to be offered in the school.<br>2.5.5 Regional administration check of school programs to identify the numbers and types of teachers teaching mathematics courses.<br>2.5.6 Enrichment inservice course offerings to assist teachers in integrating their major field of competence with mathematics.<br>2.5.7 Mini-seminars for single-skill development in content or methods (Attachment 5)<br>2.5.8 Accountability of ALL teachers of math to work with the math department chairperson for help and for plan submission. (Attachment 4)<br>2.5.9 Math department chairpersons given time to observe and support the instructional needs of teachers. (Attachment 4)<br>2.5.10 Placement and recruitment of math teachers done cooperatively with personnel and mathematics department, DCPS. |

PROBLEM #2 (con't) (Inadequate instruction in mathematics-secondary and elementary)

| Factors contributing to the problem: | Recommendations for addressing the problem |
|---|---|
| 2.6 Need for more staff development and inservice opportunities to be offered during the school year and summer for enrichment and other professional needs. | 2.6.1 Periodic needs surveys- disseminated through department chairs to identify staff development needs.<br>2.6.2 At least one full day staff development for ALL mathematics teachers, each semester. These staff development activities would be provided cooperatively by the mathematics department, DCPS, and regional staff.<br>2.6.3 Department chairpersons given on-half day per month for staff development/ leadership training with math department staff. This leadership training will enable chairpersons to provide staff development and other professional duties within the school's department. The chairperson is to be elected and given a grade of ET13.<br>2.6.4 Each school expected to have at least one-half day staff development for math department per advisory. This will be coordinated by the department chairperson, with resources and other assistance from the DCPS math department<br>2.6.5 Internships with universities, businesses, and professional organizations made available during the summer for teachers.<br>2.6.6 Representatives from government. Business, and professional organizations asked to be a part of staff development activities to keep teachers informed of career opportunities and applications of mathematics for their students.<br>2.6.7 Staff development to include:<br>A. Higher level cognitive skills<br>B. Use of manipulatives, media & computers<br>C. Mathematics integrated with other subjects<br>D. Motivational activities and strategies<br>2.6.8 Four experienced EMRTs assigned as trainers of EMRTs. |

| Factors contributing to the problem: | Recommendations for addressing the problem |
|---|---|
| 2.7 Low morale of teachers caused by such issues as: | |
| 2.7.1 Lack of recognition for work done well. | 2.7.1 Yearly awards to outstanding math teachers in each region. Announcements in newsletter, by superintendent and news media. |
| 2.7.2 Demands of time for preparation and remedial work with students. | 2.7.2 Teachers of remedial classes given more school preparation time. |
| 2.7.3 Too few opportunities to work with students who are excited about their work in mathematics. | 2.7.3 All teachers given the opportunity to work with other than remedial students. Also, teachers encouraged to have extra-curricular activities for math enjoyment. |
| 2.7.4 Isolation from mathematics Dept., DCPS, and what is going on in math city-wide and nation-wide. | 2.7.4 At least two city-wide or regional meetings for all math teachers, during the school day, each year. |
| 2.7.5 Bad press about school efforts | 2.7.5 More press releases about the positive outcomes of math teaching. A newsletter from the math department to identify those positive activities in math education, including outstanding students and teachers. |
| 2.7.6 Expectations that extra work should be done on their own without remuneration. | 2.7.6 Additional pay for those teachers who work with students in special mathematics programs. |
| 2.7.7 Not having the opportunity to teach math they have learned to enjoy: Too much remedial work in arithmetic. | 2.7.7 Teachers given the opportunity to offer peers and students enrichment sessions in mathematics as a part of extra-curricular programs or as special program days during the regular school time. |

PROBLEM #3 Student Disaffection with Mathematics

| Factors contributing to the problem: | Recommendations for addressing the problem |
|---|---|
| 3.1 Improper placement of students into courses for which they do not have adequate entry level skills, or for which they are over-skilled and become bored. (Attachment 7) | 3.1 A comprehensive city-wide policy to ensure that student placement is done with the student skill level as a major consideration, not ease of scheduling. |
| 3.2 Insufficient number of motivational activities used in mathematics. | 3.2.1 Inclusion of motivational strategies in inservice curricula. |
| | 3.2.2 Extra-curricular courses (math clubs, etc.) to motivate students to achieve in mathematics. |
| | 3.2.3 Increase the number of academic enrichment programs, summer and school year, for a variety of achievement levels. Programs may be at the university or the D.C. Public Schools. |
| 3.3 Lack of adequate use of role models to inspire enthusiasm and desire to do mathematics. | 3.3 Provide the contact for resources such as blacks & mathematics, DCCTM, and other professional organizations to math chairpersons, so that role models can be invited to the schools to inform students of careers in math-related fields; or students to take field trips to those organizations & businesses where math-related careers are evident. |
| 3.4 Mathematics classroom activities which rely on an overuse of drill & low cognitive skills (Attachment 8) | 3.4 Inservice and staff development activities to provide instructional options to drill and low level cognitive skill development. |

PROBLEM #3 (con't) (Inadequate instruction in mathematics-elementary and secondary)

| Factors contributing to the problem: | Recommendations for addressing the problem |
|---|---|
| 3.5 Lack of support by significant others (parents, friends, etc.) for student involvement in mathematics. | 3.5 Information to parents about the needs for student math involvement. This will include data on future career possibilities (and limitations) School P.T.A. |
| 3.6 Students not perceiving mathematics as something they are capable of doing. | 3.6 Counselor and teacher training to help identify the need to encourage students' self-confidences in mathematics capabilities. |

APPENDIX L

SELF EVALUATION AND NEEDS SURVEY FORM

FUNDAMENTAL CONCEPTS IN MATHEMATICS

Self Evaluation and Needs Survey

Position _____ Date _____

Last four digits of Social Security Number _____

Everyone has some fear of math--math anxiety. On a scale of 1 to 10 (with 1 indicating being totally math anxious and 10 indicating no fear of math), how would you rate your feelings about math? _____

Approximately how many semester hours of math have you taken (not including methods courses)? _____

On a scale of 1 to 10 (with 1 indicating total hatred of math and 10 indicating a great love for math), how would you rate your feelings about math? _____

Check the areas below in which your knowledge is a bit shaky:

inductive and deductive processes _____

determining number patterns _____

problem-solving techniques _____

flow diagrams _____

various number systems _____

properties of operations _____

solving equations _____

BASIC (computer language) _____

Please feel free to express any other concerns about this course that you might have.

APPENDIX M

COURSE TITLES AND NUMBERS OF ENROLLEES IN THE
UDC/DCPS MATHEMATICS CERTIFICATION PROGRAM

UDC/DCPS Certification Program

| Dates | Course Title | Number Enrolled |
|---|---|---|
| Fall, 1982 | Fundamental Concepts of Mathematics 1 | 15 |
| Fall, 1982 | Pre-calculus/Trigonometry 1 | 9 |
| Fall, 1982 | Pre-calculus/Trigonometry 2 | 7 |
| Winter, 1983 | Fundamental Concepts of Mathematics 1 | 4 |
| Winter 1983 | Problem Solving | 7 |
| Winter, 1983 | Pre-calculus/Trigonometry 1 | 7 |
| Winter, 1983 | Pre-calculus/Trigonometry 2 | 8 |
| Winter, 1983 | Calculus 1 | 12 |
| Spring, 1983 | Pre-calculus/Trigonometry 2 | 6 |
| Spring, 1983 | Calculus 1 | 7 |
| Spring, 1983 | Calculus 2 | 10 |
| | Total | 92 |